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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/675,575

09/30/2003

Leonard J. Olmer

Bevers

9967

2-3-16-20/075903-8

47396

7590

10/10/2006

EXAMINER

EL ARINI, ZEINAB

HITT GAINES, PC
AGERE SYSTEMS INC.
PO BOX 832570
RICHARDSON, TX 75083

ART UNIT

PAPER NUMBER

1746

DATE MAILED: 10/10/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/675,575

Applicant(s)

OLMER ET AL.

Examiner

Zeinab E. EL-Arini

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 September 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-5,7,9-12,14-20,22,24-26,28 and 30-34 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-5,7,9-12,14-20,22,24-26,28 and 30-34 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 9/1/06 has been entered.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-5, 7, 9-12, 14-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Catalano (4,845,043) in combination with Kikuchi (5,620,559) (new reference), Fujisaki et al. (US 2004/0043570 A1), Raaijmakers et al. (6,492,283), and Yates (6,350,322).

3. Catalano discloses a method for manufacturing layers of semiconductor material comprising the steps of introducing a first reaction mixture comprising a silicon-containing gas and a first doping gas into a deposition chamber; depositing a first doped layer comprising silicon in the deposition chamber from the first reaction mixture and forming gaseous residual contamination comprising the unreacted first doping gas and

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its reaction products; contacting said gaseous residual contamination in the chamber with decontamination gas capable of reacting with the residual contamination and substantially removing the residual contamination from the chamber; and introducing a second reaction mixture comprising a silicon- containing gas into the chamber and depositing a second layer comprising silicon on the first doped layer. See col. 3, lines 11-26. The decontamination gas is nitrogen trifluoride. See col. 5, lines 1-20, and col. 6, lines 36-60. The reference does not teach the temperature, the time, the flow rate, and cleaning the surface and forming a hydrogen termination and hydrogen bake as claimed.

4. Kikuchi discloses a method of manufacturing a semiconductor device. The method comprises an excitation energy is applied to a flow of gas containing hydrogen to generate a plasma. See the abstract. The reference also discloses that residual by-products on the surface of the semiconductor substrate can be efficiently removed by processing the substrate with a gas containing hydrogen radicals. See col. 2, line 51- col. 3, line 3, col. 7, lines 61-67. The reference discloses cleaning the surface, and forming a hydrogen termination on the surface, and exposing the surface to nitrogen fluoride. The reference also discloses the oxide film removing system may be used for preparatory for a film forming system. See col. 5, lines 40-45.

5. Fujisaki et al. disclose a process and apparatus for producing semiconductor device. The reference discloses after forming a diffusion layer on the silicon substrate 13, a surface thereof is cleaned by chemical solution, thereafter subjected to a pretreatment by hydrofluoric acid diluted by de-ionized water to thereby remove native

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oxide formed on the surface of the substrate and form a hydrogen-absorbed layer referred as hydrogen termination. See paragraph 39. The reference also discloses when the Si substrate subjected to the hydrogen termination is heated, at 560 C. or higher, hydrogen atoms at the surface are evaporated and the silicon nitride film, which does not include Si-H bonds, is formed. See paragraph 45, and Fig. 5.

Catalano in combination with Kikuchi and Fujisaki et al. as discussed supra do not teach cleaning the surface using RCA cleaning process and drying the surface with isopropyl alcohol as claimed.

Raaijmakers et al. disclose a method of forming ultra thin oxide layer on a surface of silicon substrate. The reference discloses the RCA cleaning process as claimed. See col. 1, lines 43-51, col. 5, line 66- col. 6, line 14, and col. 7, lines 5-10.

It would have been obvious for one skilled in the art to use the cleaning solution taught by Raaijmakers et al. in the process taught by Catalano in combination with Kikuchi and Fujisaki et al. to obtain the claimed process, because it is well known in the art to clean a semiconductor substrate, before a film forming process, see Kikuchi, col. 5, lines 40-45.

The references as discussed supra do not teach drying the surface with the alcohol as claimed.

Yates discloses a method of reducing water spotting and oxide growth on a semiconductor structure. The reference discloses drying the substrate with alcohol as claimed. The reference discloses that chemical treatment, rinsing, and drying are carried out in a single vessel. See the abstract.

It would have been obvious for one skilled in the art to use the drying step taught by Yates in the process taught by the combination of the cited references to obtain the claimed process and to improve the cleaning process by removing any trace of the chemical cleaning solution remains on the surface of the substrate.

It would have been obvious for one skilled in the art to supply hydrogen as taught by Kikuchi in the Catalano process to enhance and improve the removal process. It would have been obvious for one skilled in the art to adjust the temperature, the time, and the flow rate of the nitrogen-containing gas taught by Catalano to improve the removal process, and to use the hydrogen termination and the depositing temperature taught by Fujisaki et al. in the Catalano process to improve the cleaning process. This is also because it is well known in the art to use the hydrogen termination step and cleaning step before depositing layer step, see Kikuchi, col. 5, lines 40-45. Subjecting the surface of the semiconductor substrate to hydrogen bake is well known in the art. It would have been obvious for one skilled in the art to adjust the flow rate and the time to obtain the claimed process. This is also because generally, differences in concentration or temperature will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical. "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955) (Claimed process which was performed at a temperature between 40°C and 80°C and an acid concentration between 25% and 70% was held to be prima facie obvious over a reference process

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which differed from the claims only in that the reference process was performed at a temperature of 100°C and an acid concentration of 10%.); see also Peterson, 315 F.3d at 1330, 65 USPQ2d at 1382 (“The normal desire of scientists or artisans to improve upon what is already generally known provides the motivation to determine where in a disclosed set of percentage ranges is the optimum combination of percentages.”); In re Hoeschele, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969) (Claimed elastomeric polyurethanes which fell within the broad scope of the references were held to be unpatentable thereover because, among other reasons, there was no evidence of the criticality of the claimed ranges of molecular weight or molar proportions.). For more recent cases applying this principle, see Merck & Co. Inc. v. Biocraft Laboratories Inc., 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied, 493 U.S. 975 (1989); In re Kulling, 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990); and In re Geisler, 116 F.3d 1465, 43 USPQ2d 1362 (Fed. Cir. 1997). A particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation. In re Antonie, 559 F.2d 618, 195 USPQ 6 (CCPA 1977) (The claimed wastewater treatment device had a tank volume to contractor area of 0.12 gal./sq. ft. The prior art did not recognize that treatment capacity is a function of the tank volume to contractor ratio, and therefore the parameter optimized was not recognized in the art to be a result-effective variable.). See also In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980) (prior art suggested proportional balancing to achieve desired results in the formation of an alloy).

6. Claims 19-20, 22, 24-26, 28, and 30-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Catalano (4,845,043) in combination with Kikuchi (5,620,559).

7. Catalano discloses a method for manufacturing layers of semiconductor material comprising the steps of introducing a first reaction mixture comprising a silicon-containing gas and a first doping gas into a deposition chamber; depositing a first doped layer comprising silicon in the deposition chamber from the first reaction mixture and forming gaseous residual contamination comprising the unreacted first doping gas and its reaction products; contacting said gaseous residual contamination in the chamber with decontamination gas capable of reacting with the residual contamination and substantially removing the residual contamination from the chamber; and introducing a second reaction mixture comprising a silicon-containing gas into the chamber and depositing a second layer comprising silicon on the first doped layer. See col. 3, lines 11-26. The decontamination gas is nitrogen trifluoride. See col. 5, lines 1-20, and col. 6, lines 36-60. The reference does not teach the temperature, the time, the flow rate, and hydrogen bake as claimed.

8. Kikuchi discloses a method of manufacturing a semiconductor device. The method comprises an excitation energy is applied to a flow of gas containing hydrogen to generate a plasma. See the abstract. The reference also discloses that residual by-products on the surface of the semiconductor substrate can be efficiently removed by

processing the substrate with a gas containing hydrogen radicals. See col. 2, line 51-
col. 3, line 3, col. 7, lines 61-67.

9. It would have been obvious for one skilled in the art to supply hydrogen as taught by Kikuchi in the Catalano process to enhance and improve the removal process. It would have been obvious for one skilled in the art to adjust the temperature, the time, and the flow rate of the nitrogen-containing gas taught by Catalano, and the temperature and the time for duration of the supplied hydrogen to obtain optimum results.

10. This is also because generally, differences in concentration or temperature will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical. "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955) (Claimed process which was performed at a temperature between 40°C and 80°C and an acid concentration between 25% and 70% was held to be prima facie obvious over a reference process which differed from the claims only in that the reference process was performed at a temperature of 100°C and an acid concentration of 10%.); see also *Peterson*, 315 F.3d at 1330, 65 USPQ2d at 1382 ("The normal desire of scientists or artisans to improve upon what is already generally known provides the motivation to determine where in a disclosed set of percentage ranges is the optimum combination of percentages."); *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969) (Claimed elastomeric polyurethanes which fell

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within the broad scope of the references were held to be unpatentable thereover because, among other reasons, there was no evidence of the criticality of the claimed ranges of molecular weight or molar proportions.). For more recent cases applying this principle, see *Merck & Co. Inc. v. Biocraft Laboratories Inc.*, 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied, 493 U.S. 975 (1989); *In re Kulling*, 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990); and *In re Geisler*, 116 F.3d 1465, 43 USPQ2d 1362 (Fed. Cir. 1997). A particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation. *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977) (The claimed wastewater treatment device had a tank volume to contractor area of 0.12 gal./sq. ft. The prior art did not recognize that treatment capacity is a function of the tank volume to contractor ratio, and therefore the parameter optimized was not recognized in the art to be a result-effective variable.). See also *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980) (prior art suggested proportional balancing to achieve desired results in the formation of an alloy).

Response to Arguments

11. Applicant's arguments with respect to claims 1-5, 7, 9-12, 14- 20, 22, 24-26, 28, and 30-34 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Kikuchi et al. (6,024,045) disclose an apparatus and method for fabricating semiconductor device.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Zeinab E. EL-Arini whose telephone number is (571) 272-1301. The examiner can normally be reached on Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Barr can be reached on (571) 272-1414. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Zeinab E. EL-Arini
Zeinab E. EL-Arini
Primary Examiner
Art Unit 1746

ZEE
09/29/06